CLAIMS

1. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), said system comprising:

circuit-data-receiver to receive circuit data;

CE-to-IP function which further comprises:

packetizer to pack said circuit-data into data packets;

encapsulator to encapsulate said data packets with headers;

layer-2 incorporator to add the layer-2 operations, and wherein

said IP network transmits said encapsulated data packets.

2. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said circuit data comprises any of three types: structured, unstructured, or SDH virtual containers (VC's).

3. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said circuit data source stream comprises a T1/E1 or T3/E3 stream.

4. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 3, wherein said system further comprises a framer component.

5. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 3, wherein said packetizer packs data into packets via collecting relevant time slots (TSs) from each TDM frame.

6. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said circuit data source stream comprises a virtual container or VC-12 (SDH).

7. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 6, wherein said system additionally comprises a SDH framer.

8. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 7, wherein said system further comprises a High Order Path Adaptation function.

9. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said High Order Path Adaptation function is a G.783 function.

10. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said packetizer

further comprises a packet transmit function that generates no packets when a loss of pointer is detected.

11. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said packetizer further comprises a packet transmit function that generates a special control packet when HPA generates an error.

12. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said packetizer further comprises a packet transmit function that ignores HPA indications and transfers all data transparently.

13. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said packetizer further comprises a packet receive function that detects loss or reception of erroneous UDP/RTP packet.

14. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 13, wherein said erroneous UDP/RTP packet is an UDP checksum error.

15. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said packetizer further comprises a packet receive function that detects a loss of three consecutive VC-12 frames.

16. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said packetizer further comprises a packet receive function outputs a AIS signal upon receipt of a control packet.

17. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 8, wherein said packetizer further comprises a packet receive function detects error as defined in G.826.

18. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said circuit data source stream comprises a fractional T1 and fractional E1 transfer stream.

19. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said step of encapsulating data packets involves encapsulation with any of the following headers: RTP, UDP, and IP headers.

20. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said system is

implemented across networks comprising any of LANs, WANs, cellular, Internet or Web based networks.

21. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said data packet further comprises:

a layer-2 header for storing layer-2 header information;

an IP field for storing IP header information;

an UDP header for storing UDP header information;

a RTP header for storing RTP header information;

a data field for storing data, and

an optional trailer field.

22. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 1, wherein said system further comprises a clock-recoverer.

23. A computer-based communication system implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 22, wherein said clock-recoverer further comprises:

a receiver which receives the RTP packet;

a sampler which samples a local time stamp and a buffer pointer position;

a time-stamp-estimator which tests the sync number and calculates the estimated time stamp;

an error-calculator which calculates the error;

an inserter that inserts into array said calculated error in the right sync position according to right sync number;

a 2T-integral-calualtor which calculates the new integral on 2T by adding the error to the integral;

a T-integral-calculator which calculates the new integral on T by adding half of said error from said array;

a minimum-packet-comparator which maintains a continuous flow of RTP packets if minimum number of packets are reached;

a ratio-calculator that calculates the ratio of said integral on 2T and said integral on T;

a ratio-range-checker that checks to see if said ratio is between 1.5 and 3;

an angle-calculator which calculates the angle using linear regression;

a clock adjuster which adjusts clock according to said angle, and

a resetter which resets all counters, starts new windows, and start receiving RTP packets.

24. A computer-based method implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), comprising the following steps:

receiving circuit data;

passing said circuit data through a CE-to-IP function, which further comprises

packing data into data packets;

encapsulating said data packets with headers;

incorporating said data packets with layer-2 headers, and

transmitting said encapsulated and layer-2 incorporated data packets via a IP network.

25. A computer-based method implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 24, wherein said circuit data source stream comprises a T1/E1 or T3/E3 stream.

26. A computer-based method implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 24, wherein said circuit data source stream comprises a fractional T1 and fractional E1 transfer stream.

27. A computer-based method implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 24, wherein method further comprises a framer component.

28. A computer-based method implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 24, wherein said step of encapsulating data packets involves encapsulation with any of the following headers: RTP, UDP, and IP headers.

29. A computer-based method implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 24, wherein said method further comprises the additional step of passing the data packets through a clock recovery function.

30. A computer-based method implementing circuit emulation service over an Internet Protocol network (CES over IP, CESOIP), as per claim 29, wherein said step of passing the received data packets through a clock recovery function further comprises:

receiving the RTP packet;

sampling a local time stamp and a buffer pointer position;

testing the sync number and calculating the estimated time stamp;

calculating the error;

inserting into array said calculated error in the right sync position according to right sync number;

calculating the new integral on 2T by adding the error to the integral;

calculating the new integral on T by adding half of said error from said array;

receiving RTP packets again if minimum number of packets are reached;

calculating the ratio of integral on 2T and the integral on T;

checking to see if said ratio is between 1.5 and 3;

calculating the angle by using linear regression;

adjusting clock according to said angle, and

resetting all counters, start new windows, and start receiving RTP packets.